



# Subjective assessment of facial aesthetics after maxillofacial orthognathic surgery for obstructive sleep apnoea

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## Abstract

We aimed to evaluate the subjective perception of facial appearance by patients after maxillofacial surgery for obstructive sleep apnoea (OSA), and explored the possible correlation between satisfaction and surgical outcome. A total of 26 patients, 24 men and 2 women (mean (SD) age 45 (7) years), subjectively assessed their facial appearance before and after operation using a visual analogue scale (VAS). To investigate a possible association between postoperative facial appearance and surgical outcome, we analysed postoperative scores for the apnoea/hypopnoea index (AHI) and Epworth sleepiness scale (ESS). Postoperatively, 14 (54%) indicated that their facial appearance had improved, 4 (15%) recorded a neutral score, and 8 (31%) a lower score. The rating of facial appearance did not correlate with changes in the AHI or ESS following surgery. This study supports the view that most patients are satisfied with their appearance after maxillofacial orthognathic surgery for OSA. The subjective perception of facial aesthetics was independent of the surgical outcome.

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## Introduction

Obstructive sleep apnoea (OSA) is a condition of increasing importance because of its neurocognitive and cardiovascular sequelae,<sup>1–3</sup> and a growing number of studies have highlighted the role of maxillofacial orthognathic surgery in the management of patients who fail to tolerate, or decline treatment with continuous positive airway pressure (CPAP). Although maxillomandibular advancement is reported to be as effective as CPAP,<sup>4</sup> it is important to consider the prospect of an altered facial profile following surgery. The potential for alteration to the facial profile may dissuade some patients from considering orthognathic surgery as treatment option.

A small number of studies have explored the topic of facial aesthetics in patients treated surgically for OSA.<sup>5–9</sup> Although some studies have shown high levels of satisfaction with the

facial profile and the overall perception of treatment,<sup>5,6</sup> others have suggested that patients are not concerned about aesthetics after surgery.<sup>8</sup> However, the possibility of dissatisfaction with the facial appearance after maxillomandibular advancement for OSA is important from a consent point of view. Several factors might influence subjective ratings of facial aesthetics after surgery, and patients with poor outcomes may rate their appearance more negatively.

The aim of this study was two-fold. First, we wished to evaluate the subjective perception of facial appearance by patients after maxillomandibular advancement for OSA, and secondly, to explore the possible correlation between levels of satisfaction and recognised outcome measures of surgical success. To our knowledge, this potential association has not previously been formally evaluated in published studies.

## Method

We retrospectively surveyed the subjective perception of facial appearance by patients who had maxillomandibular

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advancement for OSA at our institution after they had failed to tolerate use of CPAP and other non-invasive treatments. We evaluated their assessments of their facial appearance before, and at least 6 months after operation using a 10 cm horizontal linear visual analogue scale (VAS) (0: very dissatisfied to 10 cm: highly satisfied). We also analysed demographic and clinical characteristics including polysomnographic data to assess whether there was an association between these variables and the subjective perception of facial aesthetics after surgery. In particular, we evaluated scores for the Epworth sleepiness scale (ESS) and apnoea/hypopnoea index (AHI). The ESS is a validated questionnaire that enables patients with OSA to subjectively assess their degree of daytime sleepiness. The AHI is an objective measure of disordered breathing during sleep, and is derived from a sleep study. The number of periodic reductions (hypopnoea) or cessations (apnoea) in breathing secondary to obstruction of the upper airway is used to assess the severity of the condition.

Data were analysed using SPSS Statistics for Windows version 17.0 (SPSS Inc, Chicago). Parametric statistical tests were used, and Pearson's correlation coefficient was used to assess the association between subjective VAS scores and AHI and ESS scores.

## Results

A total of 51 patients had maxillomandibular advancement for OSA at our institution. Preoperative and postoperative VAS scores were available for 26 (24 male and 2 female). Baseline characteristics are shown in Table 1.

The mean VAS score for satisfaction with the facial appearance was 4.1 (range 2–8) before, and 6.5 (range 2–10) after operation. Fourteen patients (54%) gave a higher rating

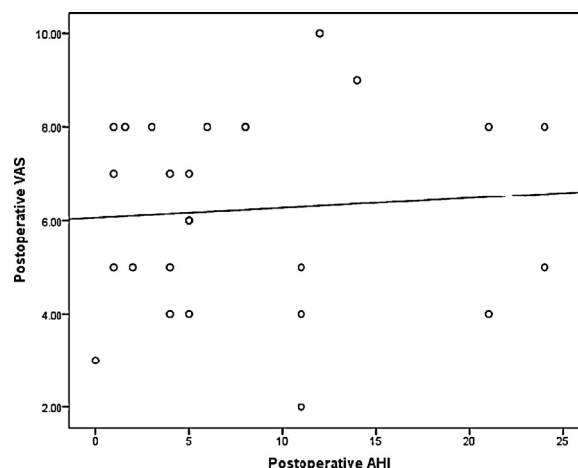


Fig. 1. Scatter plot showing correlation between postoperative apnoea/hypopnoea index (AHI) and subjective facial score on visual analogue scale (VAS).

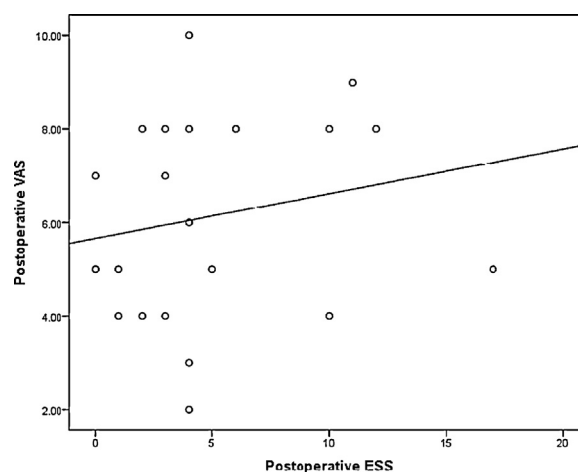


Fig. 2. Scatter plot showing correlation between postoperative Epworth sleepiness scale (ESS) and subjective facial score on visual analogue scale (VAS).

Table 1

Baseline characteristics of the study sample. Data are number (%) unless otherwise stated.

Variable	Measurement (n = 26)
Mean (SD) age (years)	45 (7)
Sex	
Male	24 (92)
Female	2 (8)
Mean (SD) body mass index	28 (3)
Smokers	9 (35)
Alcohol	21 (81)
CPAP	
Tried	23 (88)
Not tried*	3 (12)
Skeletal profile	
Class I	21 (81)
Class II	5 (19)
Procedure	
Bimaxillary advancement with genioplasty	24 (92)
Bimaxillary advancement	2 (8)
Mean (SD) maxillary advancement (mm)	8.1 (2)
Mean (SD) mandibular advancement (mm)	8.3 (2)

CPAP: continuous positive airway pressure.

\* Declined CPAP or used it for less than 4 weeks.

for satisfaction with their facial appearance postoperatively, 4 (15%) thought there was no change, and 8 (31%) gave a lower rating.

The postoperative ESS score in patients who thought there had been an improvement or no change in their facial appearance was similar to that in those who had rated their aesthetic score as lower (mean (SD) 7 (4) and 7 (3), respectively). Postoperatively, the mean (SD) AHI score in those who thought that their facial appearance had improved or was similar was 8.8 (2); in those less satisfied it was 10.5 (3). The difference was not statistically significant.

Scatter plots showing potential correlation between subjective VAS scores for satisfaction with facial appearance and postoperative AHI and ESS scores are shown in Figs. 1 and 2. Postoperative scores for facial appearance and the ESS ( $r=0.22$ ,  $p>0.05$ ) did not correlate. Similarly, scores for postoperative facial appearance did not correlate with changes in the AHI ( $r=0.08$ ,  $p>0.05$ ).

## Discussion

Our data show high levels of subjective satisfaction with the postoperative facial appearance (improved score in 54%, neutral score in 15%). Of the 8 who reported a lower score for appearance, only one regretted having the operation.

Our findings are in keeping with the study by Li et al.<sup>5</sup> who reported on the perception of facial appearance in 44 patients who had maxillomandibular advancement for OSA. A total of 24 reported favourable changes, 14 reported neutral responses, and 4 thought that the changes were unfavourable. In a smaller study, Liu et al.<sup>6</sup> reported that all patients in their series ( $n=12$ ) were satisfied with the facial aesthetic result after surgery, with 11 of 12 patients rated by lay individuals as having improved facial aesthetic scores postoperatively. A French study also objectively assessed the attractiveness of the postoperative facial profile of 15 patients after maxillomandibular advancement.<sup>7</sup> Using clinical photographs they asked 40 orthodontists and 100 lay people to compare preoperative and postoperative profiles. Eighty-five percent of the assessors thought that the changes in profile were favourable, and no significant difference was seen between the orthodontists and the lay group. Interestingly, the authors found no correlation between preoperative skeletal characteristics and aesthetic preferences, but retrusion of the upper lip, an open nasolabial angle, and a dolichofacial type were found to be positive predictors of postoperative objective aesthetic preference. In their cases series ( $n=18$ ), Smatt and Ferri<sup>8</sup> stated that patients did not seem to be bothered by postoperative facial aesthetics. Our experience is that the potential for an unfavourable alteration in facial appearance is an important consideration given the number who indicated a lower VAS score after operation. Overall however, most of our patients seemed satisfied with the result.

In a review, Li<sup>9</sup> emphasised the importance of discussing the potential for unfavourable facial changes during preoperative investigations, and suggested that younger patients, those with pre-existing bimaxillary protrusion, and those who were not obese, have the greatest risk of being dissatisfied with the resulting appearance. Various operative modifications have been used to minimise the potential for this after maxillomandibular advancement, including counter-clockwise rotation of the maxillomandibular complex, and alteration to the occlusal plane. This may be more important in some ethnic groups that have a higher prevalence of bimaxillary protrusion.

The mean age of our group was 45 years. It has previously been hypothesised that in middle-aged adults with signs of facial ageing and laxity of the soft tissue, maxillomandibular advancement may augment the facial soft tissues and result in a more youthful appearance. Arcuri et al.<sup>10</sup> described the morphological facial changes in 16 patients after maxillomandibular advancement, and analysed its effects in restoring the signs of ageing, particularly the loss of facial height and depth. They noted that 13 patients had signs of rejuvenation after operation and described the effect

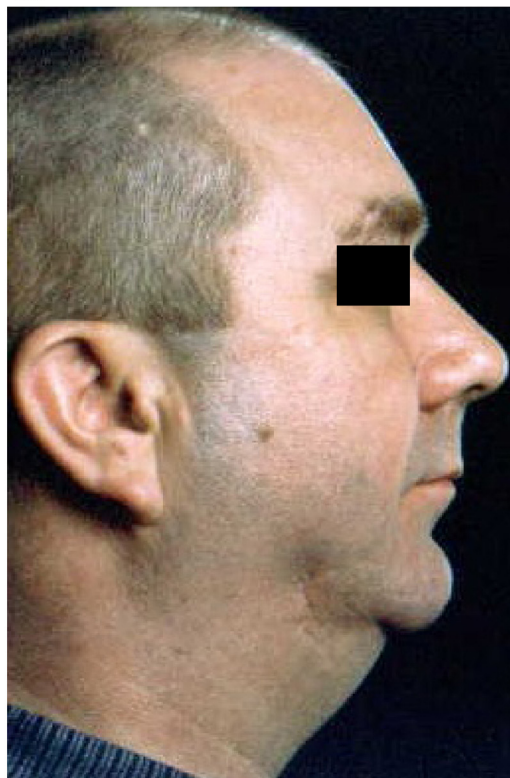
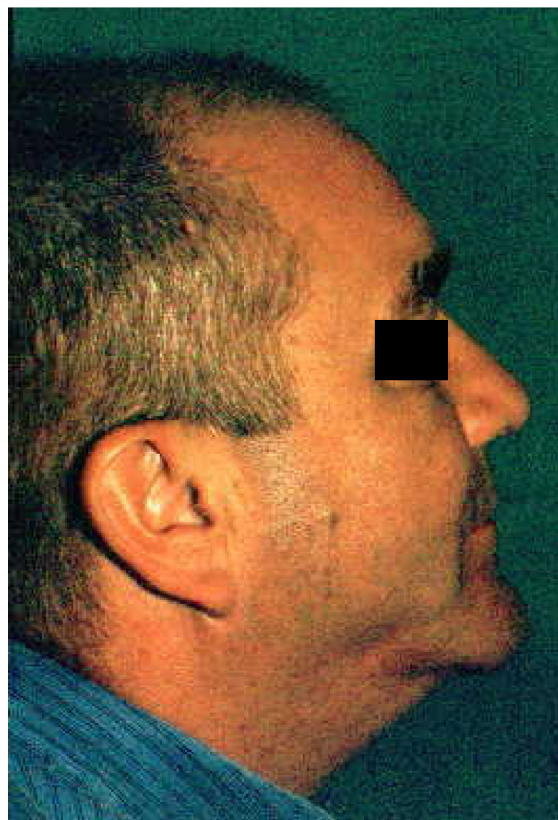
**A****B**

Fig. 3. Preoperative (A) and postoperative (B) photographs of facial profile after maxillomandibular advancement for obstructive sleep apnoea (OSA) (published with the patient's consent).



as a “reverse face-lift”. This morphological phenomenon may help to explain why 54% of our patients recorded an improved facial aesthetic score after operation (Fig. 3).

The primary goal for surgeons who perform maxillo-mandibular advancement in patients with OSA is to alleviate obstruction of the upper airway and reduce the associated symptoms. Surgical outcome measures commonly used in this context are a reduction in ESS and AHI scores. In our search of the published literature, we could not find a study that explored the possible correlation between surgical success and patients’ perception of facial aesthetics after maxillomandibular advancement for OSA. It seems reasonable that operative outcomes may be linked to a patient’s overall perception of their treatment, and possibly their perception of the resulting facial alteration. Those who experience a smaller reduction in the ESS or AHI, or both, from baseline values, may feel less positive about their appearance in the light of an apparently less successful procedure. When stratified by postoperative facial VAS scores (improved or neutral scores compared with negative scores) differences in mean postoperative ESS and AHI scores were not statistically significant. Subjective VAS scores did not correlate with changes in the AHI or ESS after operation.

Our results show that about two-thirds of patients reported a more favourable or neutral assessment of their facial appearance after surgery. This information is important to surgeons who counsel patients referred for maxillomandibular advancement surgery. Although around one-third of patients reported unfavourable effects, we found no correlation between surgical success and facial appearance VAS scores. Subjective satisfaction with facial aesthetics does not seem to be linked to overall surgical outcome.

### Conflict of interest

We have no conflicts of interest.

### Ethics statement/confirmation of patient permission

The patient gave his consent to the images being published in medical journals.

### References

1. Lurie A. Obstructive sleep apnea in adults: epidemiology, clinical presentation, and treatment options. *Adv Cardiol* 2011;**46**:1–42.
2. Drager LF, Togeiro SM, Polotsky VY, et al. Obstructive sleep apnea: a cardiometabolic risk in obesity and the metabolic syndrome. *J Am Coll Cardiol* 2013;**62**:569–76.
3. Vijayan VK. Morbidities associated with obstructive sleep apnea. *Expert Rev Respir Med* 2012;**6**:557–66.
4. Randerath WJ, Verbraecken J, Andreas S, et al., European Respiratory Society task force on non-CPAP therapies in sleep apnoea. Non-CPAP therapies in obstructive sleep apnoea. *Eur Respir J* 2011;**37**:1000–28.
5. Li KK, Riley RW, Powell NB, et al. Patient’s perception of the facial appearance after maxillomandibular advancement for obstructive sleep apnea syndrome. *J Oral Maxillofac Surg* 2001;**59**:377–80.
6. Liu SR, Yi HL, Guan J, et al. Changes in facial appearance after maxillo-mandibular advancement for severe obstructive sleep apnoea hypopnoea syndrome in Chinese patients: a subjective and objective evaluation. *Int J Oral Maxillofac Surg* 2012;**41**:1112–9.
7. Cohen-Levy J, Petelle B, Vieille E, et al. Changes in facial profile after maxillomandibular advancement surgery for obstructive sleep apnea syndrome. *Int Orthod* 2013;**11**:71–92.
8. Smatt Y, Ferri J. Retrospective study of 18 patients treated by maxillomandibular advancement with adjunctive procedures for obstructive sleep apnea syndrome. *J Craniofac Surg* 2005;**16**:770–7.
9. Li KK. Maxillomandibular advancement for obstructive sleep apnea. *J Oral Maxillofac Surg* 2011;**69**:687–94.
10. Arcuri F, Brucoli M, Benec R, et al. Maxillomandibular advancement in obstructive sleep apnea syndrome: a surgical model to investigate reverse face lift. *J Craniofac Surg* 2011;**22**:2148–52.